**EPA comments to the BERA Proposed Wildlife Exposure Modeling Approach**
**Technical Memorandum**
**Columbia Falls Aluminum Company NPL Site**
**Columbia Falls, Montana**
**Issued August 17, 2018**

**Responses Prepared for Columbia Falls Aluminum Company, LLC by Roux / EHS Support, LLC**
**Prepared December 6, 2018**

**Specific Comments – USEPA Comments in Black.** Roux / EHS Support LLC responses in blue.

1) Deterministic Exposure Point Concentrations (Page 11) - Please provide examples of reasons to deviate for the Pro-UCL-recommended 95th percentile upper confidence limit of the mean. Defaulting to the maximum concentration when this value is less than the 95th percentile upper confidence limit of the mean is not in-line with USEPA's ProUCL Technical Guide.

   The technical memorandum did not suggest defaulting to the maximum concentration when the 95th percentile upper confidence limit is greater than the maximum concentration. As stated, defaulting to the maximum concentration when the 95th percentile upper confidence limit of the mean $UCL_{mean}$ exceeds the maximum is not appropriate.

   The last sentence of the first full paragraph on page 11 regarding deviations from the ProUCL recommended $UCL_{mean}$ was intended to provide some flexibility in selecting UCLs other than those recommended by EPA ProUCL software. ProUCL occasionally recommends the 97.5 or 99% UCL on the arithmetic mean estimated by the Chebyshev method when other methods (e.g., Hall's or bootstrap-t UCL with outliers) result in a 95% UCL that exceeds the maximum value. In these cases, the data will be reviewed, and the 95% UCL estimated by the Chebyshev method may be selected as the EPC in those situations to be consistent with the intent of the reasonable maximum exposure paradigm as defined by EPA (1989; 2002). This approach is also consistent with ProUCL guidance, which states "*In such cases [i.e., when the 97.5% or 99% Chebyshev UCL is recommended by the ProUCL software], when the sample size is large (and other UCL methods such as the bootstrap-t method yield unrealistically high values due to the presence of outliers), one may want to use a 95% Chebyshev UCL or a Chebyshev UCL with a lower confidence coefficient such as 90% as an estimate of the population mean, especially when the sample size is large (e.g., >100, 150)*" (EPA, 2015).

   Text consistent with the information presented in this response will added to the technical memorandum.

   REFERENCES:

   U.S. Environmental Protection Agency (EPA). 2015. *ProUCL Version 5.1 Technical Guide. Statistical Software for Environmental Applications for Data Sets with and without Non-detect*

*Observations*. U.S. Environmental Protection Agency Office of Research and Development. EPA/600/R-07/041. October 2015.

U.S. Environmental Protection Agency (EPA). 2002. *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites*. OWSER 9285.6-10, December.

U.S. Environmental Protection Agency (EPA). 1989. *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)*. Interim Final, Office of Emergency and Remedial Response, Washington, D.C., EPA/540/1-89/002.

2) Deterministic Exposure Point Concentrations -Soil (Page 11) – The technical memorandum describes EPC calculations for ISM samples for the entire operational area for large home range receptors. Please clarify the text to include a description for how grab samples collected within the operational area will be used in the BERA. Please clarify how EPCs will be calculated for large home range receptors with home ranges greater than the Site (i.e., explanation for how ISM and grab samples will be combined is needed recognizing that sampling technique varied throughout the Site).

Two soil sampling strategies were employed during the Phase I and Phase II Site Characterization sampling: judgmental grab sampling across the entire Site and incremental sampling methodology (ISM) only within the Operational Area grid. The Operational Area grid represents the only portion of the Site where both sampling regimes were employed.

Due to different underlying statistical properties, it is not appropriate to combine data derived from ISM and grab samples to calculate statistical parameters [e.g., 95% upper confidence limit (UCL) of the mean] to estimate exposure point concentrations (EPCs). Because grab samples were collected consistently in exposure areas throughout the Site, the technical memorandum will be revised to indicate that grab sample data will be used as the basis for calculating EPCs for large ranging receptors that may forage in multiple exposure areas. Only data from grab samples that are appropriate for use in the BERA (i.e., that were collected for the purpose of characterizing the soil concentrations consistent with other grab samples that comprise the BERA dataset) will be included in EPC calculations. Because grab sample data will be available from the Operational Area to evaluate exposure to large-range receptors within the ecological exposure areas that overlap the Operational Area (Central Landfill Area and Main Plant Area), ISM soil data collected within the Operational Area will not be evaluated separately in exposure estimates for large-range receptors.

ISM soil data collected within the Operational Area will be evaluated in the BERA as focused areas of exposure for small ranging and sessile ecological receptors within the Central Landfill and Main Plant ecological exposure areas. ISM results will be evaluated for each grid based on point-by-point comparisons with ecological benchmarks to evaluate soil exposure to plants, soil invertebrates, and wildlife receptors with foraging ranges less than the size (approximately one acre) of the ISM decision units (DUs). Results from grab samples that are appropriate for use in the BERA and that overlap the Operational Area ISM sample grid will also be included in the point-by-point evaluation for small range and sessile ecological receptors.

EPCs for large-range receptors that include multiple exposure areas (up to and including all exposure areas within the Site), will be calculated using a sum of spatially-weighted estimated daily doses (EDDs) from each of the exposure areas where the receptor may forage. For example, if the size of the Main Plant Area is 70% of the receptor home range, and other sampled areas outside the Main Plant Area (but within the home range of the species) includes

an additional 20% (with off-site areas comprising the remaining 10% of the home range), then the total EDD will be equal to (0.7 x Main Plant Area EDD) + (0.2 x non-Main Plant Area EDD) for each chemical.

Text consistent with the information presented in this response will be added to the revised technical memorandum.

3) Deterministic Exposure Point Concentrations -Soil (Page 11) – The technical memorandum describes the EPC for small home range receptors when ISM samples are available. Please clarify the text to include a description for how grab samples collected within the same exposure area will be used in the BERA.

As stated in the response to Comment 2, data from the ISM samples and the grab samples that overlap the ISM grid footprint will be used to evaluate small home range receptors on a point-by-point basis. The grab samples will also be used in the calculation of the 95% UCLs of the exposure area they are a part of for the purposes of estimating EPCs for larger ranging receptors.

Text consistent with the information presented in this response will added to the revised technical memorandum.

4) Deterministic Exposure Point Concentrations - Soil (Page 12) – the depth-weighted average approach for 0-2 feet of soil is not appropriate for assessing risk to non-burrowing receptors that are exposed to COPCs primarily in the zero to six-inch depth interval.

The text in the memorandum will be adjusted to state that the depth-weighted average approach for 0-2 feet bgs of soil will be used to calculate EPCs for representative receptors that are expected to burrow during foraging and nesting activities. Life history strategies of the evaluated receptors were reviewed, and the receptors that will be considered "burrowing receptors" that are exposed to a 0-2 feet soil depth will include the meadow vole, long-tailed weasel, and North American wolverine. EPCs for all other receptors will be based on surface (0-0.5 feet bgs) soil concentrations.

Text consistent with the information presented in this response will added to the technical memorandum.

5) Deterministic Exposure Point Concentrations - Surface Water (Page 13) – Please provide clarification of the surface water bodies that will be used in the EPC calculation for large home range receptors whose home range is greater than the Site.

This issue was resolved during the comment and response cycle for the BERA work plan (please see Comment 5 and the associated response in the *Responses Prepared for Columbia Falls Aluminum Company*, Dated February 13, 2018, transmitted on September 25, 2018), which was performed concurrently with the review of this Technical Memorandum. The resolution was to include all surface water bodies at the site for the evaluation of large home range receptors. The table in Section 5.2.3.2 of the most recent version of the BERA Work Plan submitted for review (dated October 24, 2018) reflects this change in how surface water exposure will be evaluated for large home range receptors.

Text consistent with the information presented in this response will added to the technical memorandum.

6) Probabilistic Exposure Point Concentrations (Page 14) – Truncation of the exposure concentrations based on upper and lower tolerance limits in the main risk characterization of the BERA is not appropriate if data are highly variable. This type of analysis may be appropriate in an uncertainty discussion regarding representativeness of EPCs.

   The technical memorandum will be revised to indicate that the simulated exposure distributions will be truncated at 0 to prevent the simulation from selecting negative exposure concentrations. Extreme concentrations at the upper tail of the simulated distribution will be retained in the primary exposure calculations. However, if extreme concentrations are observed at the upper tail of the simulated distribution, the upper tail of the simulated exposure distribution may be truncated based on the upper tolerance limit of the site-specific dataset and evaluated as a separate scenario in the uncertainty section of the BERA.

7) Toxicity Reference Values (Page 26) – *Development of Toxicity Reference Values for Conducting Ecological Risk Assessment at Naval Facilities in California, Interim Final* (Engineering Field Activity West 1998) should also be considered as a source for toxicity reference values.

   The reference listed in the comment was not identified online. However, the Navy/BTAG TRVs that are presented in the California Department of Toxic Substances Control Human and Ecological Risk Division (HERD) Ecological Risk Assessment Note Number 4 (HERD, 2000) were based on an Engineering Field Activity West (1997) document that, by its title, appears to be closely related to the one indicated in the comment. If this is not accurate, please provide the document referenced in the comment (i.e., Engineering Field Activity West, 1998).

   The TRVs presented in HERD (2000) were evaluated to supplement TRVs proposed in the technical memorandum for COPECs lacking TRVs in primary compilation sources, including EPA Ecological Soil Screening Levels (Eco-SSLs) or TechLaw (2008). Of the TRVs proposed in Table 7 of the technical memorandum, avian and mammalian TRVs for mercury and mammalian TRVs for thallium are available in HERD (2000) but not EPA Eco-SSLs or TechLaw (2008). The technical memorandum will be revised to include mammalian TRVs presented in HERD (2000) to evaluate exposure to thallium. However, the mercury TRVs in HERD (2000) were based on exposure to methylmercury; therefore, these TRVs are not appropriate for comparison to doses calculated from exposure point concentrations for total mercury. Avian and mammalian TRVs for mercury identified from studies compiled in Sample et al. (1996) will be retained to evaluate mercury exposure (see Technical Memorandum Table 7).

   Text consistent with the information presented in this response will be added to the technical memorandum.

   REFERENCE:

California Department of Toxic Substances Control Human and Ecological Risk Division (HERD). 2000. *HERD Ecological Risk Assessment Note Number 4*. December 8.

Engineering Field Activity West. 1997. *Development of Toxicity Reference Values as Part of a Regional Approach for Conducting Ecological Risk Assessments at Naval Facilities in California.* Draft Technical Memorandum. Prepared by PRC Environmental Management, Inc. June.

8) Toxicity Reference Values - Dioxin/Furans (Page 28) – References to Table 6 in this section should reference Table 7.

The references to Table 6 in this section will be changed to Table 7.

9) Toxicity Reference Values – Dioxin/Furans (Page 28) – The toxicity of dioxins and furans vary by bird species (Farmahin et al. 2012, 2013) and species tend to fall into one of three sensitivity categories (high, medium, and low). We suggest using a TRV derived for a bird within the high sensitivity category (e.g., chicken) or reducing the TRV derived for ring-necked pheasants (medium sensitivity) to a level that is applicable to high sensitivity birds.

The articles referenced in the comment indicate that birds show varying responses to dioxin-like compounds, and generally fall into three groups, with the chicken being the most sensitive. However, adjusting the currently proposed TRV for ring-necked pheasant to account for the greater sensitivity of chickens and chicken-like birds is not recommended for two reasons. First, as stated in Farmahin et al., 2012, using toxicity data associated with the most sensitive bird species (i.e., the chicken) to evaluate dioxins would likely overestimate potential risk of adverse effects, and could lead to inappropriate decisions about remedial options at contaminated sites. Second, chickens, or chicken-like birds, are not receptors of concern that are being evaluated for potential ecological risk at the Site. Ideally, the test species used to develop the TRV should be as closely related to the evaluated receptors as possible so that uncertainty associated with species-related sensitivity is minimized (Allard et al., 2009). Ring-necked pheasants and Japanese quail, which comprise the second and third group in terms of dioxin sensitivity (Farmahin et al., 2012, 2013), are more closely related to the types of bird species of interest at the site. Therefore, it is recommended to retain the TRV that is currently proposed that is based on toxic effects to the ring-necked pheasant.

REFERENCE:

Allard, P., A. Fairbrother, B.K. Hope, R.N. Hull, M.S. Johnson, L. Kapustka, G. Mann, B. McDonald, and B. E. Sample. 2009. *Recommendations for the Development and Application of Wildlife Toxicity Reference Values.* Integrated Environmental Assessment and Management 6(1): 28-37.

**References submitted with comments**

Engineering Field Activity West. 1998. *Development of Toxicity Reference Values for Conducting Ecological Risk Assessment at Naval Facilities in California, Interim Final.* EFA West, Naval Facilities Engineering Command. United States Navy. San Bruno, CA. September 1998.

Farmahin, R., et al. 2012. Sequence and in vitro function of chicken, ring-necked pheasant, and Japanese quail AHR1 predict in vivo sensitivity to dioxins. Environmental Science and Technology 46: 2967-2975.

Farmahin, R., et al. 2013. Amino Acid Sequence of the ligand-binding domain of the aryl hydrocarbon receptor 1 predicts sensitivity of wild birds to effects of dioxin-like compounds. Toxicological Sciences 131:139-152.